

II. REMARKS

A. Status of Claims

Claims 1-9, 11-43 and 107-118 were pending at the time of the Action. Claims 1, 4-6, 12-22, 24-31, 113, 115 and 118 have been amended. Claim 119 has been added. No claims were canceled; therefore, claims 1-9, 11-43 and 107-119 are currently pending.

B. Amendments to the Claims

Claims 1 has been amended as follows: (1) to make a typographical change requested by the Action, (2) to change “being” to “comprises”, and (3) to add the proviso “said sacrificial agent does not comprise polyethylene glycol (PEG) or aromatic compounds having carboxylic acid groups or salts thereof.” Similarly, claims 4 and 6 have been amended to add the provisos “said glycol derivative is not polyethylene glycol (PEG)” and “said polyglycols are not polyethylene glycols . . . said carboxylic acids or carboxylic acid derivatives are not aromatic carboxylic acids or salts thereof,” respectively. Support for these provisos is found in the Specification at page 7, line 10; page 9, line 26; and in original claims 21 and 95.

Polyethylene glycol has been deleted from claims 5, 13 and 115, and the species polyethylene glycol 200, polyethylene glycol 400, and polyethylene glycol 2000 have been deleted from claims 21 and 118. The term “carboxylate” has been deleted from claim 4, and the species “sodium 1 naphthoate” and the species “phenyl acetic acid” and “2 naphthoic acid” have been deleted from claims 5 and 15, respectively. Furthermore, claims 4-6, 12-22, 24-31 and 113 have been amended to replace the verb “is” with the transitional phrase “comprises.”

Claim 119 was added to more specifically claim one of the embodiments of the invention. Support for this new claim is provided by claims 1, 2 and 3 as originally filed.

No new matter is added by any of the above amendments.

C. Response to the Objections to the Specification

The Action objects to the definitions given in the specification to the terms “fly ash” and “air entrainment,” stating that these are repugnant to their usual meaning. Applicants disagree. As discussed below, the definition of both terms in the Specification pass the clarity standard of the current MPEP § 2173.05(a) (8th Edition, Incorporating Revision No. 6). Also they would not be considered repugnant under the standard of the old MPEP § 2173.05(a) (7th Edition). The Action also requests that claim 1 be amended from “2% vol” to “2 vol.%.” Since the Applicants consider both abbreviations to be equivalent, in the interest of efficiently moving this case towards allowance, Applicants have made the requested amendment.

At the outset, Applicants note that the Action appears to be evaluating the Specification using the standards of an older edition of the MPEP. The current edition of the MPEP (8th Edition, Incorporating Revision No. 6) allows a patentee to be his or her own lexicographer and even to use terms in a manner “contrary to or inconsistent with one or more of their ordinary meanings.” *See* MPEP § 2173.05(a)(III). Applicants further note that this section was revised between the 7th and 8th Editions. In the 7th Edition, the third heading of § 2173.05(a) read, “A TERM MAY NOT BE GIVEN A MEANING REPUGNANT TO ITS USUAL MEANING,” and the paragraph below that heading cited to the 1947 case of *In re Hill*, 161 F.2d 367 (CCPA 1960). In contrast, in the 8th Edition, the third heading of this section reads, “TERMS USED CONTRARY TO THEIR ORDINARY MEANING MUST BE CLEARLY REDEFINED IN THE WRITTEN DESCRIPTION.” The paragraph beneath this heading no longer cites *In re Hill*, instead citing a more recent case from the Federal Circuit for the following proposition: “Consistent with the well-established axiom in patent law that a patentee or applicant is free to be his or her own lexicographer, a patentee or applicant may use terms in a manner contrary to or inconsistent with one or more of their ordinary meanings if the written description clearly

redefines the terms.” See MPEP § 2173.05(a) (8th Edition, incorporating Revision 6), citing *Process Control Corp. v. HydReclaim Corp.*, 190 F.3d 1350, 1357 (Fed. Cir. 1999). The change from the 7th to the 8th Edition of the MPEP refocuses the evaluation of a patentee’s definition away from the concept of “repugnancy” towards the issue of “clarity.” However, in the present case, it appears that the Action is attempting to evaluate the definitions of the Specification under the older standard.

Furthermore, even if one were to apply the older standard of “repugnancy,” it has always been the case that a definition provided in a Specification can only be objected to for being “repugnant” if it is extremely unreasonable. Since both definitions provided by the Specification are reasonable in light of their ordinary meanings, they cannot even be considered “contrary” to those meanings, and since they can’t be characterized as “contrary,” there is even less basis for characterizing them as “repugnant.”

In the case of “fly ash,” the Action objects because the definition used in the Specification includes ash from materials other than from coal combustion. The Specification at page 11 defines “fly ash” as follows:

The term “fly ash”, as defined by ASTM C 618 (Coal Fly Ash or Calcined Natural Pozzolan For Use in Concrete) refers to a by product of coal combustion. However, the present invention may employ similar combustion products which are fine ashes or flue dusts resulting from co-firing various fuels with coal, or resulting from the combustion of other fuels that produce an ash having pozzolanic qualities (the ability to form a solid when mixed with water and an activator such ash lime or alkalis) or hydraulic qualities (the ability to form a solid when mixed with water and set). The ash itself has pozzolanic/hydraulic activity and can be used as a cementitious material to replace a portion of portland cement in the preparation of concrete, mortars, and the like. In general, the term fly ash as used herein includes:

- 1) Ash produced by co-firing fuels including industrial gases, petroleum coke, petroleum products, municipal solid waste, paper sludge, wood, sawdust, refuse derived fuels, switchgrass or other biomass material, either alone or in combination with coal.
- 2) Coal ash and/or alternative fuel ash plus inorganic process additions such as soda ash or trona (native sodium carbonate/bicarbonate used by utilities).
- 3) Coal ash and/or alternative fuel ash plus organic process additives such as activated carbon, or other carbonaceous materials, for mercury emission control.
- 4) Coal ash and/or alternative fuel ash plus combustion additives such as borax.
- 5) Coal ash and/or alternative fuel gases plus flue gas or fly ash conditioning agents such as ammonia, sulfur trioxide, phosphoric acid, etc.

While the Applicants have chosen a definition that is broader than the definition provided by ATSM C 618, their broader definition has also been adopted by others, including industry actors, governmental agencies and an authoritative encyclopedia, as shown in the following table.

Definition (emphasis added)	Source
Fine solid particles of ashes, dust, and soot carried out from burning fuel (as coal or oil) by the draft	Encyclopaedia Britannica Online http://www.britannica.com/
The finely divided, inert particles of ash in flue gases arising from the combustion of fuel .	Illinois Clean Coal Institute Energy Research for a Cleaner Environment Clean Coal Technology Glossary www.icci.org/glossary.html
The finely divided particles of ash suspended in gases resulting from the combustion of fuel .	National Energy Technology Laboratory www.netl.doe.gov/coal/Coal%20Primer/glossary.html
Non-combustible residue that results from burning fuels in an incinerator, boiler or furnace.	San Bernardino County Fire Department Hazardous Materials Division 620 South "E" Street San Bernardino, CA 92415-0153 www.sbcfire.org/hazmat/env_terms.asp
Small ash particles carried in suspension in combustion products	Harvest Energy Ltd http://www.harvestenergy.com/GlossaryPower.html

Definition (emphasis added)	Source
Non-combustible residual particles expelled by flue gas.	U.S Environmental Protection Agency www.epa.gov/OCEPAterms/fterms.html

From the references shown in the table above, it is readily concluded that a host of authoritative sources define “fly ash” to encompass combustion products from sources other than coal. Thus, the use of the term “fly ash” as defined in the Specification is both reasonable and well supported. It is neither inconsistent, nor contrary to the ordinary meaning of this term, and therefore falls far short of being characterizable as “repugnant.” Since the Specification clearly defines the term “fly ash” to encompass more than just the ash from coal combustion, Applicants respectfully request that this objection be withdrawn.

Similarly, Applicants disagree with the Action’s objection to the Specification’s use of the term “air entrainment” to encompass “other inert gases, such as nitrogen, that act in the same way as air.” *See* Specification at page 17, lines 9-11. Applicants note that air is made up of roughly 80% nitrogen. It therefore seems entirely reasonable and not at all “repugnant” to define air entrainment to encompass 100% nitrogen or other inert gases “that act in the same way as air.” Therefore, Applicants respectfully request that this objection be withdrawn.

D. Response to the Obviousness Rejections

1. JP 56022665

The Action rejects claims 1-9, 11-43 and 107-118 under 35 U.S.C § 103(a) as obvious over JP 56022665 (JP ‘665) either alone or in view of Young ‘389 A1 and Boggs ‘358 B1. The Action at pages 3 and 8. After reviewing an English translation of JP ‘665, as well as Young ‘389 A1 and Boggs ‘358 B1, Applicants respectfully disagree. The English translation of JP ‘665 is provided and attached to this response. JP ‘665 does not teach the detrimental effects of FA-carbon on air entrainment, nor does it teach a solution to this problem. Applicants note that all words in a claim must be considered in judging the patentability of a claim against the prior

art. See MPEP § 2143.03 citing *In re Wilson*, 424 F.2d 1382, 1385 (CCPA 1970). These references, regardless of whether they are viewed alone or in combination with one another, do not include each element of any of the rejected claims.

Specifically, claim 1 has the following limitations that are not met by any of these references: (1) “at least partially neutralizes detrimental effects of components of said fly ash” and (2) “causing less than 2 vol.% additional air entrainment in the cementitious mixture.” The Action takes the following position regarding these two elements:

It is known in the art that excess carbon in fly ash absorbs air entrainers and thus reduces the effectiveness of air entrainment (what applicants call the “detrimental effects of components of fly ash on air entrainment activity in their claim 1 yet do not clearly specify this is exactly what they are referring to in claim 1). It is further the examiner’s position that the glycol ether is even listed as their so called “sacrificial agent” in claim 114 so it is clear that it would also cause less than 2% volume additional air entrainment in the cementitious mixture.

The Action at pages 3–4. Applicants note that the presently pending claims only cover, for example, the use of glycol ethers, such as those listed in claims 13 and 114–116 of the present application, to the extent that the use of these compounds meets all of the limitations of claim 1. That is, the pending claim set would only cover, for example, glycol ethers that are used as sacrificial agents when present in an amount that (1) “at least partially neutralizes detrimental effects of components of said fly ash” and (2) causes “less than 2 vol.% additional air entrainment in the cementitious mixture.” Applicants note that the Action has not provided documentary evidence to support its conclusion that the disclosure in JP ‘665 (*e.g.*, the foam aid percentages) would meet both limitations 1 and 2. Applicants note that “official notice” is

inappropriate when the PTO seeks to rely upon a chemical theory. *See* MPEP § 2144.03, citing *In re Ahlert*, 424 F.2d 1088, 1091 (CCPA 1970) and *In re Grose*, 592 F.2d 1161, 1167-68 (CCPA 1979). If the Examiner is relying on personal knowledge to support his assertion above, he must provide an affidavit or declaration setting forth specific factual statements and explanations to support the finding. MPEP § 2144.04; *see also* 37 CFR 1.104(d)(2). Since neither an examiner's affidavit nor documentary evidence has been provided for the Action's position on this claim element, Applicants, therefore, respectfully request that both § 103 rejections based in whole or in part on JP '665 be withdrawn as to claim 1. Furthermore, since all the other pending claims are dependent on claim 1, Applicants also respectfully request that the corresponding rejections to these claims also be withdrawn.

Applicants also note that the Action has not provided evidence or even arguments showing how the dependent claims in the present application are rendered obvious by JP '665 either alone or in view of Young '389 A1 and Boggs '358 B1. For example, claims 2, 3 and new claim 119 all require that the amount of the sacrificial agent either exceed, or could exceed, the "amount necessary to neutralize said detrimental effects of said components of fly ash," while still meeting the other limitations of claim 1, especially the "causing less than 2 vol.% additional air entrainment in the cementitious mixture" limitation. After reviewing an English translation of JP '665, as well as Young '389 A1 and Boggs '358 B1, Applicants do not believe that these references, whether taken alone or together, teach or make this claim element obvious. For this additional reason, Applicants respectfully request that both § 103 rejections based in whole or in part on JP '665 be withdrawn as to claims 2 and 3, and not be raised as to new claim 119.

2. DE 19528912

The Action rejects claims 1-9, 11-43 and 107-118 under 35 U.S.C § 103(a) as obvious over DE 19528912 (DE '912) either alone or in view of Young '389 A1 and Boggs '358 B1. The Action at pages 4 and 8. After reviewing DE '912, as well as Young '389 A1 and Boggs '358 B1, Applicants respectfully disagree because the additives in DE '912 appear to be surfactants that function as air-entraining agents, not as sacrificial agents "causing less than 2 vol.% additional air entrainment." Therefore these three references, regardless of whether they are viewed alone or in combination with one another, do not include each element of any of the rejected claims.

Specifically, claim 1 has the following limitations that are not met by any of these references: (1) "at least partially neutralizes detrimental effects of components of said fly ash" and (2) "causing less than 2 vol.% additional air entrainment in the cementitious mixture." The Action takes the following position regarding these two elements:

The sacrificial agents of applicants' claimed invention are the same as those in DE '912 and thus the amount of additional air entrainment should also be less than 2 vol% additional air entrainment. For the same reasons as was stated in JP '665, it is known in the art that excess carbon in fly ash absorbs air entrainers and thus reduces the effectiveness of air entrainment (what applicants call the "detrimental effects of components of fly ash on air entrainment activity in their claim 1 yet do not clearly specify this is exactly what they are referring to in claim 1).

The Action at page 4. Applicants note that the presently pending claims only cover, for example, the use aromatic compounds bearing sulfonate functional groups, such as those listed in claim

21, to the extent that the use of these compounds meets all of the limitations of claim 1. That is, the pending claim set would only cover, for example, aromatic compounds bearing sulfonate functional groups that are used as sacrificial agents when present in an amount that (1) “at least partially neutralizes detrimental effects of components of said fly ash” and (2) causes “less than 2 vol.% additional air entrainment in the cementitious mixture.” In contrast, the ingredients of chemical compositions disclosed by DE ‘912 all appear to be different types of surfactants, each of which would be expected to be air-entraining and therefore not able to meet the “causing less than 2 vol.% additional air entrainment” limitation that is part of claim 1 and all the claims that depend from it. Applicants also note that the Action has neither provided documentary evidence for the assertion quoted above nor an examiner’s affidavit (see response to JP ‘665 above) to support its conclusion that the additives disclosed in DE ‘912 would meet both limitations 1 and 2. Applicants, therefore, respectfully request that both § 103 rejections based in whole or in part on DE ‘912 be withdrawn as to claim 1. Furthermore, since all pending claims are dependent on claim 1, Applicants also respectfully request that the corresponding rejections to these claims also be withdrawn.

Applicants also note that the Action has not provided evidence or even arguments showing how the dependent claims in the present application are rendered obvious by DE ‘912 either alone or in view of Young ‘389 A1 and Boggs ‘358 B1. For example, claims 2, 3 and new claim 119 all require that the amount of the sacrificial agent either exceed, or could exceed, the “amount necessary to neutralize said detrimental effects of said components of fly ash.” After reviewing DE ‘912, as well as Young ‘389 A1 and Boggs ‘358 B1, Applicants do not believe that these references, whether taken alone or together, teach or make this claim element obvious. Furthermore, given that DE ‘912 appears to disclose surfactants, a person of skill in the art would

also not expect the compounds or compositions disclosed DE '912 to be able to be added in excess and still be able to cause "less than 2 vol.% additional air entrainment in the cementitious mixture." For this additional reason, Applicants respectfully request that both § 103 rejections based in whole or in part on DE '912 be withdrawn as to claims 2 and 3, and not be raised as to new claim 119.

3. WO 85/01500 (Nicholson)

The Action rejects claims 1-9, 11-43 and 107-118 under 35 U.S.C § 103(a) as obvious over Nicholson either alone or in view of Young '389 A1 and Boggs '358 B1. The Action at pages 5 and 8. Applicants disagree because (a) the claim set has been amended and (b) these references, regardless of whether they are viewed alone or in combination with one another, do not include each element of any of the rejected claims.

Specifically, claim 1 has the following limitations that are not met by any of these references: (1) "at least partially neutralizes detrimental effects of components of said fly ash" and (2) "causing less than 2 vol.% additional air entrainment in the cementitious mixture." The Action takes the following position:

Further, the sacrificial agents are the same as those claimed by applicants and listed in their specification and thus the properties of less than 2% additional air entrainer should be the same. For the same reasons as was stated in JP '665, it is known in the art that excess carbon in fly ash absorbs air entrainers and thus reduces the effectiveness of air entrainment (what applicants call the "detrimental effects of components of fly ash on air entrainment activity in their claim 1 yet do not clearly specify this is exactly what they are referring to in claim 1).

The Action at page 5. Applicants note that the Action has neither provided documentary evidence for this assertion nor an examiner's affidavit (see response to JP '665 above) to support its conclusion that the additives disclosed in Nicholson would meet all the limitations of claim 1 (either before or after it was amended), especially limitations 1 and 2, as outlined above. Furthermore, claim 1, as amended, now contains the proviso, "said sacrificial agent does not comprise polyethylene glycol (PEG)." Given that all the other pending claims are dependent of claim 1, this proviso applies to the entire claim set. For the reasons stated above, Applicants respectfully request that both § 103 rejections based in whole or in part on Nicholson be withdrawn as to all pending claims.

Applicants also note that the Action has not provided evidence or even arguments showing how the dependent claims in the present application are rendered obvious by Nicholson either alone or in view of Young '389 A1 and Boggs '358 B1. For example, claims 2, 3 and 119 (new claim) all require that the amount of the sacrificial agent either exceed, or could exceed, the "amount necessary to neutralize said detrimental effects of said components of fly ash," while still meeting the other limitations of claim 1, especially the "causing less than 2 vol.% additional air entrainment in the cementitious mixture" limitation. After reviewing Nicholson, as well as Young '389 A1 and Boggs '358 B1, Applicants do not believe that these references, whether taken alone or together, teach or make this claim element obvious. For this additional reason, Applicants respectfully request that both § 103 rejections based in whole or in part on Nicholson be withdrawn as to claims 2 and 3, and not be raised as to new claim 119.

4. Naji *et al.* '266 B1

The Action rejects claims 1-9, 11-43 and 107-118 under 35 U.S.C § 103(a) as obvious over Naji *et al.* '266 B1 (U.S. Patent No. 6,875,266) either alone or in view of Young '389 A1

and Boggs '358 B1. The Action at pages 5 and 8. Applicants disagree because (a) the claim set has been amended and (b) these references, regardless of whether they are viewed alone or in combination with one another, do not include each element of any of the rejected claims.

Specifically, claim 1 has the following limitations that are not met by any of these references: (1) "at least partially neutralizes detrimental effects of components of said fly ash" and (2) "causing less than 2 vol.% additional air entrainment in the cementitious mixture." The Action takes the following position regarding these two elements:

For the same reasons as was stated in JP '665, it is known in the art that excess carbon in fly ash absorbs air entrainers and thus reduces the effectiveness of air entrainment (what applicants call the "detrimental effects of components of fly ash on air entrainment activity in their claim 1 yet do not clearly specify this is exactly what they are referring to in claim 1). Also, Naji et al. teach adding cellulose, starch, alginate, polyvinyl alcohol, polyethylene oxide, and polypropylene oxide which would also function as the applicants' sacrificial agents (col.3, lines 10-20). Note for example that applicants broadly claim "alcohols" as a candidate for sacrificial agent in claim 6 and polyvinyl alcohol is an alcohol. Thus, it would also be a sacrificial agent that causes less than 2% by volume additional air entrainment.

The Action at pages 5–6. Applicants point out that the pending claim set only covers, for example, alcohols used as sacrificial agents, to the extent that the use of these alcohols meets all of the limitations of claim 1. That is, the pending claim set would only cover, for example, alcohols or any of the other compounds disclosed that are used as sacrificial agents when present in an amount that (1) "at least partially neutralizes detrimental effects of components of said fly

ash” and (2) causes “less than 2 vol.% additional air entrainment in the cementitious mixture.” Applicants note that the Action has neither provided documentary evidence for this assertion nor an examiner’s affidavit (see response to JP ‘665 above) to support its conclusion that the additives disclosed in Naji *et al.* would meet the limitation of claim 1 (either before or after it was amended). Furthermore, claim 1 has been amended with the proviso, “said sacrificial agent does not comprise polyethylene glycol (PEG).” Applicants note that polyethylene oxide and polyethylene glycol are synonymous. Given that all the other pending claims are dependent of claim 1, this proviso applies to the entire claim set. For the reasons stated above, Applicants respectfully request that both § 103 rejections based in whole or in part on Naji *et al.* be withdrawn as to all pending claims.

Applicants also note that the Action has not provided evidence or even arguments showing how the dependent claims in the present application are rendered obvious by Naji *et al.* either alone or in view of Young ‘389 A1 and Boggs ‘358 B1. For example, claims 2, 3 and 119 (new claim) all require that the amount of the sacrificial agent either exceed, or could exceed, the “amount necessary to neutralize said detrimental effects of said components of fly ash,” while still meeting the other limitations of claim 1, especially the “causing less than 2 vol.% additional air entrainment in the cementitious mixture” limitation. After reviewing Naji *et al.*, as well as Young ‘389 A1 and Boggs ‘358 B1, Applicants do not believe that these references, whether taken alone or together, teach or make this claim element obvious. For this additional reason, Applicants respectfully request that both § 103 rejections based in whole or in part on Naji *et al.* be withdrawn as to claims 2 and 3, and not be raised as to new claim 119.

5. Young '389

The Action rejects claims 1-9, 11-43 and 107-118 under 35 U.S.C § 103(a) as obvious over Young '389 (U.S. Patent Publication No. 2004/0200389) either alone or in view of Boggs '358 B1. The Action at pages 6 and 8. After reviewing Young '389, as well as Boggs '358 B1, Applicants respectfully disagree because the treatment agents in Young '389 appear to be surfactants that function as air-entraining agents, not as sacrificial agents "causing less than 2 vol.% additional air entrainment." Therefore these references, regardless of whether they are viewed alone or in combination with one another, do not include each element of any of the rejected claims.

Specifically, claim 1 has the following limitations that are not met by any of these references: (1) "at least partially neutralizes detrimental effects of components of said fly ash" and (2) "causing less than 2 vol.% additional air entrainment in the cementitious mixture." The Action takes the following position regarding these two elements:

Young '389 A1 also recognizes the same problem applicants are trying to overcome in their invention regarding difficulties in using fly ash containing excess carbon that reduces air entrainment in cement mixtures. Young teaches adding solid and/or liquid chemicals as sacrificial agents to mitigate the absorption potential of fly ash (see p.2, [0016]). Young further teaches that an example of these chemicals includes detergents that have surfactants and emulsifiers. This is inclusive of anionic surfactants such as sodium lauryl sulfate as well as non-ionic surfactants such as nonyl phenol ethoxylate surfacatant (NP-9) which is most effective as a sacrificial agent or absorption agent of the carbon containing ash (see p.4, [0047] and [0060]).

The Action at page 6. Applicants note that the presently pending claims only cover the use of, for example, aromatic compounds bearing sulfonate functional groups, as listed in claim 21, to

the extent that the use of these compounds meets all of the limitations of claim 1. That is, the pending claim set would only cover, for example, aromatic compounds bearing sulfonate functional groups that are used as sacrificial agents when present in an amount that (1) “at least partially neutralizes detrimental effects of components of said fly ash” and (2) causes “less than 2 vol.% additional air entrainment in the cementitious mixture.” In contrast, the ingredients of chemical compositions disclosed by Young ‘389 all appear to be different types of surfactants, each of which would be expected to be air-entraining and therefore not able to meet the “causing less than 2 vol.% additional air entrainment” limitation that is part of claim 1 and all the claims that depend from it. Applicants also note that the Action has neither provided documentary evidence for the assertion quoted above nor an examiner’s affidavit (see response to JP ‘665 above) to support its conclusion that the additives disclosed in Young ‘389 would meet both limitations 1 and 2. Applicants, therefore, respectfully request that both § 103 rejections based in whole or in part on Young ‘389 be withdrawn as to claim 1. Furthermore, since the other pending claims are dependent on claim 1, Applicants also respectfully request that the corresponding rejections to these claims also be withdrawn.

Applicants also note that the Action has not provided evidence or even arguments showing how the dependent claims in the present application are rendered obvious by Young ‘389 A1 either alone or in view of Boggs ‘358 B1. For example, claims 2, 3 and new claim 119 all require that the amount of the sacrificial agent either exceed, or could exceed, the “amount necessary to neutralize said detrimental effects of said components of fly ash.” After reviewing Young ‘389 A1, as well as Boggs ‘358 B1, Applicants do not believe that these references, whether taken alone or together, teach or make this claim element obvious. Furthermore, given that Young ‘389 A1 appears to disclose surfactants, a person of skill in the art would also not

expect the compounds or compositions disclosed Young '389 A1 to be able to be added in excess and still be able to cause "less than 2 vol.% additional air entrainment in the cementitious mixture." For this additional reason, Applicants respectfully request that both § 103 rejections based in whole or in part on Young '389 A1 be withdrawn as to claims 2 and 3, and not be raised as to new claim 119.

6. Boggs '358 B1

The Action rejects claims 1-9, 11-43 and 107-118 under 35 U.S.C § 103(a) as obvious over Boggs '358 B1 (U.S. Patent No. 6,599,358) either alone or in view of Young '389 A1. The Action at pages 6 and 8. Applicants disagree, but note that in the interest of efficiently moving this case towards allowance, claim 1 has been amended to add the proviso "said sacrificial agent does not comprise . . . aromatic compounds having carboxylic acid groups or salts thereof." Similarly, claim 6 has been amended to add the proviso "said carboxylic acids or carboxylic acid derivatives are not aromatic carboxylic acids or salts thereof." The term "carboxylate" has been deleted from claim 4, and the species "sodium 1-naphthoate" and the species "phenyl acetic acid" and "2 naphthoic acid" have been deleted from claims 5 and 15, respectively. Applicants believe these amendments are sufficient to overcome the Examiner's rejection based on Boggs '358 B1 either alone or in view of Young '389 A1. Applicants, therefore, respectfully request that both § 103 rejections based in whole or in part on Boggs '358 B1 be withdrawn as to claim 1. Furthermore, since all the other pending claims are dependent on claim 1, Applicants also respectfully request that the corresponding rejections to these claims also be withdrawn.

7. MacDonald '352

The Action rejects claims 1-9, 11-43 and 107-118 under 35 U.S.C § 103(a) as obvious over MacDonald '352 (U.S. Patent No. 5,654,352) either alone or in view of Young '389 A1 and

Boggs '358 B1. The Action at pages 7 and 8. Applicants disagree because these references, regardless of whether they are viewed alone or in combination with one another, do not include each element of any of the rejected claims.

Specifically, claim 1 has the following limitations that are not met by any of these references: (1) "at least partially neutralizes detrimental effects of components of said fly ash" and (2) "causing less than 2 vol.% additional air entrainment in the cementitious mixture." The Action takes the following position regarding these two elements:

MacDonald '352 teaches air entrainment in cement mixes comprising high carbon fly ash and teaches adding a composition of high polymer protein powder, water, polyvinyl alcohol, and a soap gel solution (see col.3, lines 1-15). It is the examiner's position that polyvinyl alcohol can be construed as the sacrificial agent since applicants claim their sacrificial agent is an alcohol (see applicants' claim 6). The properties such as less than 2 vol% additional air entrainment would also have been expected since applicants state in claim 6 alcohol is an example of a sacrificial agent.

The Action at page 7. Applicants point out that the pending claim set only covers, for example, alcohols used as sacrificial agents, to the extent that the use of these alcohols meets all of the limitations of claim 1. That is, the pending claim set would only cover, for example, alcohols or any of the other compounds disclosed that are used as sacrificial agents when present in an amount that (1) "at least partially neutralizes detrimental effects of components of said fly ash" and (2) causes "less than 2 vol.% additional air entrainment in the cementitious mixture." Applicants note that the Action has neither provided documentary evidence for this assertion nor an examiner's affidavit (see response to JP '665 above) to support its conclusion that the additives disclosed in MacDonald '352 would meet both limitations 1 and 2. For the reasons

stated above, Applicants respectfully request that both § 103 rejections based in whole or in part on MacDonald ‘352 be withdrawn as to all pending claims.

Applicants also note that the Action has not provided evidence or even arguments showing how the dependent claims in the present application are rendered obvious by MacDonald ‘352 either alone or in view of Young ‘389 A1 and Boggs ‘358 B1. For example, claims 2, 3 and 119 (new claim) all require that the amount of the sacrificial agent either exceed, or could exceed, the “amount necessary to neutralize said detrimental effects of said components of fly ash,” while still meeting the other limitations of claim 1, especially the “causing less than 2 vol.% additional air entrainment in the cementitious mixture” limitation. After reviewing MacDonald ‘352, as well as Young ‘389 A1 and Boggs ‘358 B1, Applicants do not believe that these references, whether taken alone or together, teach or make this claim element obvious. For this additional reason, Applicants respectfully request that both § 103 rejections based in whole or in part on MacDonald ‘352 be withdrawn as to claims 2 and 3, and not be raised as to new claim 119.

8. Hoarty *et al.* ‘362

The Action rejects claims 1-9, 11-43 and 107-118 under 35 U.S.C § 103(a) as obvious over Hoarty *et al.* ‘362 (U.S. Patent No. 5,110,362) either alone or in view of Young ‘389 A1 and Boggs ‘358 B1. The Action at pages 6 and 8. After reviewing Hoarty *et al.* ‘362, as well as Young ‘389 A1 and Boggs ‘358 B1, Applicants respectfully disagree because the treatment agents in Hoarty *et al.* ‘362 appear to be surfactants that function as air-entraining agents, not as sacrificial agents “causing less than 2 vol.% additional air entrainment.” Therefore these three references, regardless of whether they are viewed alone or in combination with one another, do not include each element of any of the rejected claims.

Specifically, claim 1 has the following limitations that are not met by any of these references: (1) “at least partially neutralizes detrimental effects of components of said fly ash” and (2) “causing less than 2 vol.% additional air entrainment in the cementitious mixture.” The Action takes the following position regarding these two elements:

Hoarty et al. '362 also teach air entraining a cement mixture of fly ash of carbon content by adding a water soluble C8 fatty acid salt as the air entrainer and sodium octanoate or potassium octanoate as the sacrificial agent (see claim 1 in col.4). The octanoate is the sacrificial agent since is present in amounts sufficient to stabilize entrained air and lower the rate of air loss. This can be accomplished by the octanoate literally used as the sacrificial agent, scavenger agent, or absorption agent for the carbon present in the fly ash which could reduce air entrainment.

The Action at page 7. Applicants note that the presently pending claims only cover the use of sacrificial agents to the extent that the use of these compounds meets all of the limitations of claim 1. That is, the pending claim set would only cover sacrificial agents when present in an amount that (1) “at least partially neutralizes detrimental effects of components of said fly ash” and (2) causes “less than 2 vol.% additional air entrainment in the cementitious mixture.” In contrast, the ingredients of chemical compositions disclosed by Hoarty *et al.* '362 all appear to be different types of surfactants, each of which would be expected to be air-entraining and therefore not able to meet the “causing less than 2 vol.% additional air entrainment” limitation that is part of claim 1 and all the claims that depend from it. Applicants also note that the Action has neither provided documentary evidence for the assertion quoted above nor an examiner’s affidavit (see response to JP ‘665 above) to support its conclusion that the additives disclosed in Hoarty *et al.* ‘362 would meet both limitations 1 and 2. Applicants, therefore, respectfully

request that both § 103 rejections based in whole or in part on Hoarty *et al.* '362 be withdrawn as to claim 1. Furthermore, since all the other pending claims are dependent on claim 1, Applicants also respectfully request that the corresponding rejections to these claims also be withdrawn.

Applicants also note that the Action has not provided evidence or even arguments showing how the dependent claims in the present application are rendered obvious by Hoarty *et al.* either alone or in view of Young '389 A1 and Boggs '358 B1. For example, claims 2, 3 and new claim 119 all require that the amount of the sacrificial agent either exceed, or could exceed, the "amount necessary to neutralize said detrimental effects of said components of fly ash." After reviewing Hoarty *et al.*, as well as Young '389 A1 and Boggs '358 B1, Applicants do not believe that these references, whether taken alone or together, teach or make this claim element obvious. Furthermore, given that Hoarty *et al.* appears to disclose surfactants, a person of skill in the art would also not expect the compounds or compositions disclosed Hoarty *et al.* to be able to be added in excess and still be able to cause "less than 2 vol.% additional air entrainment in the cementitious mixture." For this additional reason, Applicants respectfully request that both § 103 rejections based in whole or in part on Hoarty *et al.* be withdrawn as to claims 2 and 3, and not be raised as to new claim 119.

9. Okimura *et al.* '978

The Action rejects claims 1-9, 11-43 and 107-118 under 35 U.S.C § 103(a) as obvious over Okimura *et al.* '978 (U.S. Patent No. 4,453,978) either alone or in view of Young '389 A1 and Boggs '358 B1. The Action at pages 7 and 8. After reviewing Okimura *et al.* '978, as well as Young '389 A1 and Boggs '358 B1, Applicants respectfully disagree because the treatment agents in Okimura *et al.* '978 appear to be surfactants and Vinsol resin, both of which would be expected to function as air-entraining agents, not as sacrificial agents "causing less than 2 vol.%

additional air entrainment.” Therefore these three references, regardless of whether they are viewed alone or in combination with one another, do not include each element of any of the rejected claims.

Specifically, claim 1 has the following limitations that are not met by any of these references: (1) “at least partially neutralizes detrimental effects of components of said fly ash” and (2) “causing less than 2 vol.% additional air entrainment in the cementitious mixture.” The Action takes the following position regarding these two elements:

Okimura et al. '978 teach a combination of polyoxyethylene sorbitan oleate (which is the air entrainer) and Vinsol resin which is a conventionally used air entrainer that could be the sacrificial agent (See Table 7, example 1 in col.5). Okimura et al. teach that the polyoxyethylene sorbitan oleate is not substantially adsorbed by unburned carbon contained in the fly ash and exhibits excellent air entraining effect (col.1 last paragraph). Note that applicants' sacrificial agent can be another air entrainer since it still could cause up to but not including 2 vol% air entrainment.

The Action at pages 7–8. Applicants note that the presently pending claims only cover the use of sacrificial agents to the extent that the use of these compounds meets all of the limitations of claim 1. That is, the pending claim set would only cover sacrificial agents when present in an amount that (1) “at least partially neutralizes detrimental effects of components of said fly ash” and (2) causes “less than 2 vol.% additional air entrainment in the cementitious mixture.” In contrast, the ingredients of chemical compositions disclosed by Okimura *et al.* '978 all appear to be either surfactants (*e.g.*, polyoxyethylenesorbitan oleate) or Vinsol wood resin, either of which would be expected to be air-entraining and therefore not able to meet the “causing less than 2 vol.% additional air entrainment” limitation that is part of claim 1 and all the claims that depend

from it. Furthermore, Applicants note that in Okimura *et al.* '978, the Vinsol resin only appears to have been used as a reference air-entraining agent and not in combination with the sorbitan oleate; *see*, for example, Examples 1 and 2 of Okimura *et al.* '978 (columns 5 and 6). Hence, Okimura does not teach using either sorbitan oleate or the Vinsol resin as a sacrificial agent.

Applicants also note that the Action has neither provided documentary evidence for the assertion quoted above nor an examiner's affidavit (see response to JP '665 above) to support its conclusion that the agents disclosed in Okimura *et al.* '978 would meet both limitations 1 and 2. For the above reasons, Applicants respectfully request that both § 103 rejections based in whole or in part on Okimura *et al.* '978 be withdrawn as to claim 1. Furthermore, since all the other pending claims are dependent on claim 1, Applicants also respectfully request that the corresponding rejections to these claims also be withdrawn.

Applicants also note that the Action has not provided evidence or even arguments showing how the dependent claims in the present application are rendered obvious by Okimura *et al.* '978 either alone or in view of Young '389 A1 and Boggs '358 B1. For example, claims 2, 3 and 119 (new claim) all require that the amount of the sacrificial agent either exceed, or could exceed, the "amount necessary to neutralize said detrimental effects of said components of fly ash," while still meeting the other limitations of claim 1, especially the "causing less than 2 vol.% additional air entrainment in the cementitious mixture" limitation. After reviewing Okimura *et al.* '978, as well as Young '389 A1 and Boggs '358 B1, Applicants do not believe that these references, whether taken alone or together, teach or make this claim element obvious. For this additional reason, Applicants respectfully request that both § 103 rejections based in whole or in part on Okimura *et al.* '978 be withdrawn as to claims 2 and 3, and not be raised as to new claim 119.

10. Chugh '189 B1

The Action rejects claims 1-9, 11-43 and 107-118 under 35 U.S.C § 103(a) as obvious over Chugh '189 B1 (U.S. Patent No. 6,277,189) either alone or in view of Young '389 A1 and Boggs '358 B1. The Action at page 8. After reviewing Chugh '189 B1, as well as Young '389 A1 and Boggs '358 B1, Applicants respectfully disagree. These references, regardless of whether they are viewed alone or in combination with one another, do not include each element of any of the rejected claims.

Specifically, claim 1 has the following limitations that are not met by any of these references: (1) "at least partially neutralizes detrimental effects of components of said fly ash" and (2) "causing less than 2 vol.% additional air entrainment in the cementitious mixture." The Action takes the following position regarding these two elements:

Chugh '189 B1 teach producing an air entrained fly ash containing cement mixture. Chugh teach Class C fly ash and fluidized bed combustion ash are part of the mixture (col.4 lines 10-22) as well as an air entrainer (see col.10, lines 35-40). Chugh teach that fluidized bed combustion ash (FBC) are present in amounts and proportions sufficient to reduce the negative effects of the presence of unburned carbon in the Class F fly ash. Thus, FBC is the sacrificial agent in Chugh.

The Action at page 8. Applicants note that the presently pending claims only cover the use of sacrificial agents to the extent that the use of these compounds meets all of the limitations of claim 1. That is, the pending claim set would only cover sacrificial agents when present in an amount that (1) "at least partially neutralizes detrimental effects of components of said fly ash" and (2) causes "less than 2 vol.% additional air entrainment in the cementitious mixture." Applicants note that the Action has neither provided documentary evidence nor an examiner's

affidavit (see response to JP '665 above) to support its conclusion that the fluidized bed combustion ash disclosed in Chugh '189 B1 would meet both limitations 1 and 2. Applicants, therefore, respectfully request that both § 103 rejections based in whole or in part on Chugh '189 B1 be withdrawn as to claim 1. Furthermore, since all the other pending claims are dependent on claim 1, Applicants also respectfully request that the corresponding rejections to these claims also be withdrawn.

Applicants also note that the Action has not provided evidence or even arguments showing how the dependent claims in the present application are rendered obvious by Chugh '189 B1 either alone or in view of Young '389 A1 and Boggs '358 B1. For example, claims 2, 3 and 119 (new claim) all require that the amount of the sacrificial agent either exceed, or could exceed, the "amount necessary to neutralize said detrimental effects of said components of fly ash," while still meeting the other limitations of claim 1, especially the "causing less than 2 vol.% additional air entrainment in the cementitious mixture" limitation. After reviewing Chugh '189 B1, as well as Young '389 A1 and Boggs '358 B1, Applicants do not believe that these references, whether taken alone or together, teach or make this claim element obvious. For this additional reason, Applicants respectfully request that both § 103 rejections based in whole or in part on Chugh '189 B1 be withdrawn as to claims 2 and 3, and not be raised as to new claim 119.

The Examiner is invited to contact the undersigned attorney with any questions, comments or suggestions relating to the referenced patent application.

Respectfully submitted,



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Specifications

1. Name of the patent Air-entraining agent
2. Scope of the patent
 1. Air-entraining agents which consist of anionic surfactant and glycol ether of generic equation (1), with their weight proportion being 1:0.01-10.
$$\text{RO}(\text{CH}_3\text{CH}_2\text{O})_n\text{H} \quad (1)$$
R stands for alkyl group with 1-6 carbon atoms, phenyl group, or benzyl group. n is an integer number in the range 1-5.
3. Detailed description of the patent

This patent deals with air-entraining agents to obtain porous concrete by using in air-hardening or hydraulic cement.

Porous concrete is produced by adding surfactants into air-hardening or hydraulic cement and making use of their foaming power. It is widely used in architecture because of its low weight and adiabaticity.

As the surfactant, anionic agents are often used because of their large foaming power. Lower alcohols, like isopropyl alcohol, can be added as 'foam aid' in order to increase the foaming power. However, Lower alcohols require careful treatment because they have low flash points.

We have invented foam aids that increase the foaming power of anionic surfactants and also are safe in treatment.

Namely, our patent deals with air-entraining agents which can be used to produce porous concrete and which consist of anionic surfactant and glycol ether of generic equation (1).



R stands for alkyl group with 1-6 carbon atoms, phenyl group, or benzyl group. n is an integer number in the range 1-5.

Cements to which the air-entraining agents of this patent can be used include the following: casting plaster, magnesia cement, which are air-hardening cements, and Portland, silica, fly ash, alumina, blast furnace cements, which are hydraulic. In addition, the materials of this patent permit the use of

aggregates, such as pulp refuse, sand, etc for air-hardening cements, and sand, gravel, rubble, pumice, slug, and artificial aggregates for hydraulic cements.

The anionic surfactants used in the present patent are those which are usually used as air-entraining agents for concrete. They are one of, or mixture of two of the following materials, for example.

- (a) Resinate
- (b) Saturated sulfonate
- (c) Unsaturated sulfonate
- (d) Alkyl benzenesulfonate
- (e) Alkyl sulfuric acid ester
- (f) Polyoxyethylene alkyl ether sulfate ester
- (g) Polyoxyethylene phenyl ether sulfate ester

The effective weight proportion of anionic surfactant and glycol ether [Eq. (1)] is 1:0.01-10. In this range, the foaming power of the surfactant is increased and the stability of foam is improved.

The amount of anionic surfactant can vary according to objects and conditions. However, they rest in the range of usual use as air-entraining agents. It is 0.01-10 w% in air-hardening cement, and 0.001-10w% for hydraulic cement.

The air-entraining agents of the present patent have larger foaming power than traditional agents consisting of anionic surfactant and lower alcohol. Moreover, they have low flash points and thus little danger for catching fire. Also, since the anionic surfactant makes fluid of low viscosity, as is the case with traditional agents, they can be handled easily and suitable for transportation and storage.

Some examples for the application of the present patent are shown in the following:

The counter ions for these anionic surfactants can

be sodium, potassium, ammonium, monoethanol amine, diethanol amine, triethanol amine, and so forth.

Examples for the glycol ester [Eq. (1)] used in this patent are ethylene glycol monomethyl ether, diethylene glycol monomethyl ether, triethylene glycol monomethyl ether, ethylene glycol monoethyl ether, diethylene glycol monoethyl ether, ethylene glycol mono-*n*-propyl ether, ethylene glycol monoisopropyl ether, ethylene glycol mono-*n*-butyl ether, diethylene glycol mono-*n*-butyl ether, triethylene glycol mono-*n*-butyl ether, tetraethylene glycol mono-*n*-butyl ether, pentaethylene glycol mono-*n*-butyl ether, ethylene glycol mono-*n*-amyl ether, ethylene glycol mono-*n*-hexyl ether, ethylene glycol monophenyl ether, ethylene glycol monobenzyl ether. Glycol ethers with R being butyl or phenyl group and *n*=1-3 are preferable.

Example 1

100 g of usual Portland cement or casting plaster and 300 g of aqueous solution of the air-entraining agents (containing anionic surfactant) were put into a home mixer with a capacity of 24 L. The mixture was stirred for 60 seconds with 8000 rotations per minute. The height of foam was settled 5 second after the rotation ended. Then the height of foam was measured from the bottom of the mixer. The composition of the solution of the air-entraining agent and the results for measured height of foam are shown in Table 1.

The anionic surfactants used here are (A) sodium dodecyl benzenesulfonate, (B) sodium *n*-dodecyl sulfonate ester, (C) sodium polyoxyethylene-*n*-dodecylether sulfuric acid ether. The foam aids are isopropanol and various glycol ether.

In the absence of foam, the height of the liquid surface from the bottom of the mixer was 28 mm.

Table 1

Composition of air-entraining agent	Foam height (mm)
-------------------------------------	------------------

Anionic surfactant (%)	Foam aid (%)	Portland cement	Casting plaster
A 0.10	None	50	65
	i-C ₃ H ₇ OH 0.10	50	80
	" 0.20	70	100
	n-C ₄ H ₉ OC ₂ H ₄ OH 0.10	70	90
	" 0.20	110	125
B 0.10	None	60	90
	i-C ₃ H ₇ OH 0.10	70	100
	n-C ₄ H ₉ OC ₂ H ₄ OH 0.10	95	105
C 0.10	None	95	100
	i-C ₃ H ₇ OH 0.10	100	100
	" 0.15	100	110
	C ₂ H ₅ OC ₂ H ₄ OH 0.10	110	115
	n-C ₄ H ₉ OC ₂ H ₄ OH 0.05	110	110
	" 0.10	115	125
	n-C ₄ H ₉ O(C ₂ H ₄ O) ₂ H 0.05	110	120
	" 0.10	125	135
C 0.20	None	110	120
	i-C ₃ H ₇ OH 0.05	110	125
	n-C ₄ H ₉ OC ₂ H ₄ OH 0.05	135	140
	C ₆ H ₅ OC ₂ H ₄ OH 0.05	135	140

From Table 1, it is clear that the air-entraining agents of the present patent, which utilize anionic surfactant and glycol ether, have larger foaming power than the traditional agents consisting of anionic surfactant and isopropanol.

Example 2

Cement mortar was prepared by using the air-entraining agents similar to example 1, mixing usual Portland cement and river sand (diameter < 1.0 mm) with weight proportion 1:3, and making the ratio of water/cement 60 %. The amount of air was measured by the method described in ASTM C185-58T. The temperature was 23°C.

The results are shown in Table 2. It is clear that the air content is larger for the air-entraining agents of the present patent.

Table 2

Composition of air-entraining agent			Air content
Anionic Surfactant 1) (%)	Foam aid 1) (%)		(%)
A 0.01	None		7.7
	i-C ₃ H ₇ OH	0.005	10.1
	n-C ₄ H ₉ OC ₂ H ₄ OH	0.002	8.9
	"	0.005	13.2
	n-C ₄ H ₉ O(C ₂ H ₄ O) ₂ H	0.005	12.6
B 0.01	None		8.0
	i-C ₃ H ₇ OH	0.005	11.2
	n-C ₄ H ₉ OC ₂ H ₄ OH	0.005	11.9
C 0.01	None		11.3
	i-C ₃ H ₇ OH	0.005	12.0
	n-C ₄ H ₉ OC ₂ H ₄ OH	0.002	15.0
	"	0.005	17.1
	n-C ₄ H ₉ O(C ₂ H ₄ O) ₂ H	0.005	17.0

Footnote 1) Relative to Portland cement.

Example 3.

Mixture of equal amount of sodium polyoxyethylene decyl ether sulfate ester and water is hard to handle due to its high viscosity.

Sufficient fluidity is obtained when part of the water is substituted by isopropanol or ethylene glycol mono-*n*-butyl ether, to contain 50% sodium polyoxyethylene decyl ether sulfate ester, 35 % water, and 15 % isopropanol or ethylene glycol mono-*n*-butyl ether. In the case of isopropanol, the flash points (measured by the methods JIS K-2265) was 34°C, and therefore it has a relatively large danger. In contrast, the agent containing ethylene glycol mono-*n*-butyl ether did not catch fire even at 91°C.

Thus, the air-entraining agents of the present patent have high flash point and therefore are safe to handle. They have also a large solubility in water and can therefore be treated easily.